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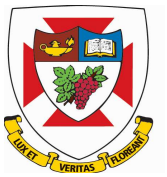

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Abstract:

Rural-urban migration has become a major feature of the Chinese economy since the mid-1990s. Due to institutional arrangements and economic and cultural factors, massive labor migration has resulted in a large left-behind population consisting of children, non-elderly married women, and the elderly. This paper examines the impacts of labor migration on time use patterns of the left-behind elderly people and children in rural China, using data derived from the China's health and Nutrition Health Survey (CHNS) for the period between 1997 and 2006. The results show that the migration of household members increases the time spent on farm work and domestic work for the left-behind elderly, and the migration of parents increases the time spent on farm work and domestic work for the left-behind children. Importantly, migration has striking gender differentiated impacts with the increase in work time being greater for elderly women and girls than elderly men and boys. These results have important policy implications.

KEYWORDS
Labor migration, time use, gender and rural China

JEL codes: J16, J22, O12

1. Introduction

Migration within developing countries is often temporary, circular and/or flexible in which only some household members participate, resulting in divided households and family members being left-behind (Whitehead and Hashim 2005). While the impact of remittances on migrants' home communities have been documented extensively (Adams and Page 2005; Liu and Reilly 2004; Niimi, Pham and Reilly 2009; Gupta, Pattillo and Wagh 2009), the influence of migration on non-income dimensions of well-being of the left-behind population has received less attention (Nguyen, Yeoh and Toyota 2006; Yeoh and Lam 2007).

China's dual transition from a collective/planned to a private/market economy, initiated in 1978, has more recently been marked by reduced state control over labour mobility resulting in a dramatic increase in internal migration from rural to urban areas.[1] The stock of migrants has increased from about 30 million in the late 1980s, to between 150 and 180 million for recent years (Fan 2009; Liang and Zhongdon 2004). Migration remains temporary due to institutional arrangements related to the residential registration system (hukou) and land user rights, as well as various other economic and cultural factors, resulting in a large left-behind population consisting of children, non-elderly married women, and the elderly. Indicative of the size of the left-behind population, almost 59 million children under the age of 18 years – 28 per cent of rural children – are left behind, living with only one parent (mostly mothers), grandparents or relatives (All China Women's Federation 2008).

While migration has raised consumption and reduced poverty (Du et al 2005;

Zhu and Luo 2008), changes in other indicators yield mixed conclusions about the impact of migration on the well-being of the left-behind population. For example, compared to elderly with children in the village, left-behind elderly are reported to experience greater emotional distress (Du et al 2004), yet other studies report lower levels of depression (Guo et al 2009), or no differences in overall life satisfaction of the two groups of elderly (Ma and Zhou 2009). Left-behind children, compared to children living with their parents, are reported to experience greater psychological issues (Biao 2007), whereas, another study finds no difference in educational attainment (Chen et al 2009).

This paper examines the impact of migration on the time allocation patterns of the left-behind elderly and children in rural China during the period 1997 to 2006. Based on data from the China Health and Nutrition Survey, the analysis focuses upon time use of the elderly (defined as people greater than 50 years of age) in three work activities (off-farm work, farm work and domestic work) and for children aged 7 to 14 years of age in two work activities (farm work and domestic work).[2]

Time use is increasingly recognized in the literature as a factor influencing well-being (Hamermesh and Pfann 2005; Blackden and Wodon 2006; Esquivel et al 2008). Time use not only provides a more comprehensive measure of work than participation, but it also can capture time allocated to domestic and farm work, two categories of work often neglected by labour force participation survey data. Time allocated to domestic and farm work directly affects the well-being of household members through the goods and services provided, including care for children and the

elderly, and is particularly valuable in developing countries where fewer goods and services are obtained in the market due to lack of income or availability.

Changes in time allocation may have mixed implications for well-being. An increase in time allocated to work increases goods and services available to the family but the impact on an individual household member's well-being depends upon the distribution of these goods and services and also, whether the concomitant reduction in leisure, socialization and personal care time, negatively impacts health status. In addition, for a given amount of total time worked, a change in time allocation from one category of work to another, such as from unpaid household farm work to wage work in the off-farm sector, may affect well-being if, for example, the access to cash earnings increases influence over household decisions improving their own well-being, as well as their children's well-being (MacPhail and Dong 2007; Song 2008).

This paper makes four main contributions to the literature. First, this study of the impact of migration on time use complements studies of the well-being of the left-behind elderly and children in rural China which have used other indicators of well-being. Second, the paper provides direct evidence of the impact of migration on the elderly and children, two population groups for which limited empirical research exists in rural China. While time allocation studies have examined how the presence of elderly in the household affects the time allocation of the working age population (Chang et al 2011; de Brauw and Giles 2008), they have not provided direct estimates of the impact of migration on the time of the elderly. With respect to the second

population group, namely children, as far as we are aware, the impact of migration on the time allocation patterns of left-behind children in rural China has not been documented. Third, since this paper examines the impact of migration on time use in three work categories – off-farm, farm and domestic - for the two population groups, it extends the work of Pang et al (2004) which has focused on time allocation patterns of the elderly in the farm and off-farm sectors only. Finally, the paper adds to the general literature on intrahousehold time allocation in developing countries by shedding light on the gendered and generational household division of labour and how these may be modified by migration.

2. A conceptual framework for migration and time use in rural China

2.1 Literature on time use patterns in rural China

Studies on time use patterns of rural households in developing countries note a remarkable division of labor based on gender and age (Mueller 1984; Jacoby 1993; Skoufias 1993). The gendered division of labour within the household in rural China is captured by a female-inside/ male-outside dichotomy (Yu and Chau 1997; Entwisle and Henderson 2000) in which appropriate roles for women are those which support the family and take place inside the household, and appropriate roles for men are those which provide for the family through activities outside of the household. For instance, studies show that women provide substantially more time than men to domestic activities (Chen 2005: Figure 2) and are less likely to be involved in local off-farm work than men (Knight and Song 2003: Table 8; Chang et al 2011: Table 2;

Xia and Simmons 2004: Table 6).

Only limited information on the time allocation patterns of children exists. Since it is illegal for children less than 16 years of age to work, official surveys do not collect data on participation of children. Nonetheless, children are involved in involved in farm work (Parish and Whyte 1978, cited in Pang el al 2004) and waged work (US 2009; US Department of Labor[3]; China Labour Bulletin[4]; and see Nieuwenhuys 1994 more generally for child labour in developing countries). Children who have migrated with their parents to cities in China are reported to have a participation rate of 10 percent and girls aged 12-15 years have substantially higher participation rates than boys (Liang, Guo and Duan 2008).

An intergenerational division of labour also exists in rural China with older household members, compared to younger members, providing fewer hours of work and also working in different work categories. For farm work, participation rates peak for men and women, respectively, in the 46-55 age group and 36-45 age group (de Brauw et al 2008: Table 3); for off-farm work, participation rates for men and women are highest for the age groups, respectively, 21 to 25 years and 16 to 20 years (Zhang et al 2004: Table 2). In households with preschool children, there is a common pattern of division of labor between the elderly woman and the daughter-in-law, with the latter working outside of the house (undertaking farm work, off-farm work, and self-employment activities) and the former working inside the house (Chen 2004).

Migration may alter the gender and intergenerational divisions and thereby, affect time use patterns because households become split between the rural and urban

areas (Fan and Wang 2008; Fan 2009)[5] and the boundary between the inside and outside is modified (Jacka 1997). Specifically, there may be a change in the gendered division of labour as women take up farm work or there may be a change in the intergenerational division of labour as the elderly provide more domestic work and care for children, whose parent or parents have migrated. For non-elderly women, empirically, migration has led to an increase in the total work time, due to a combination of increased time to farm work and domestic work and decreased time to off-farm work (Chang et al 2011: Table 8). While there is limited evidence of the impact of migration on the time allocation of the elderly, one study finds that after controlling for whether the elderly live with their married sons and health status of the elderly, then the migration status is not a statistically significant determinant of either participation or hours in farm work and off-farm work (Pang et al 2004).

2.2 Hypotheses on migration and time use in rural China

The analysis of time allocation patterns of children and the elderly in off-farm, farm, and domestic work in rural China is guided by a theory of a multi-person agricultural household model (Mueller 1984; Strauss 1986; Jacoby 1993, and Apps 2003). We take into account two important institutional features of rural economies in developing countries. First, the market for agricultural labour in developing rural economies is not extensive and farm households display high levels of labour self-sufficiency (De Janvry et al. 1991).[6] Second, market substitutes for domestic goods and services, including domestic services are not well-developed (Ilahi and

Grimard 2000) and thus, rural households rely on family labour to provide domestic goods and services.

We assume that the members of an agricultural household jointly choose the consumption of market goods, home-produced agricultural goods, domestic goods, and their respective time allocations between off-farm work, own-farm work, domestic work and leisure to maximize household welfare subject to the conventional time constraints and budget constraint. From the household's perspective[7], the time allocation of a household member to each type of work can be derived as a function of wags or shadow wages of his/her own relative to that of other household members and unearned income. Holding constant unearned income, each member allocates more time towards the activity with the highest wage or shadow wage.

Due to labor market discrimination and social norms, the wage or shadow wage of each activity differs by gender and age. Since the demand for labour in the off-farm sector is constrained, especially for women and older people, wages for off-farm work are higher than shadow wages (productivity) of farm work, and off-farm wages are higher for men than women and higher for younger people. Due to the gender norms of domestic work assignment as captured by the female-inside/ male-outside dichotomy, the shadow wages of domestic work are higher for women and girls than that of men and boys.

Theoretically, labor migration affects the time allocations of the left-behind household members through changes in their shadow wages and unearned income. Given households' high levels of labor self-sufficiency for farm work, an immediate

outcome of an adult household member's out-migration is a rise of the shadow wage of the household members left behind for farm work. The increase in shadow wages of farm work has the usual price and income effects that work in opposite directions on time allocation; it induces more hours to be supplied to farm work through a price effect but reduces work time through an income effect. The out-migration of an adult household member is also expected to raise the shadow wages of the left-behind household members for domestic work and consequently, increase their time on domestic work. Unlike farm work and domestic work, out-migration of an individual household member has no effect on the wages for off-farm work. However, labor migration changes the shadow wages of farm work and domestic work relative to the wages of off-farm work, and the labor scarcity resulting from labor migration may push the former above the latter, inducing a reallocation of time from off-farm work to farm work and domestic work.

An increase in unearned income associated with remittances from the migrant affords the left-behind household members to spend less time on off-farm or farm work and more time on leisure. However, increased income may raise the demand for home-produced goods and services (for example, spending more time making the home cleaner and meals more tasty or reading stories to children), thereby increasing the time spent on domestic work and may increase time spent on self-employment activities (off-farm).

The net effect of migration on farm work is uncertain, depending on the relative strength of the price and the income effect of a change in shadow wage as well as the

effect of remittances. However, it is plausible to assume that the positive price effect dominates the negative income effect when households' income levels are low and their desire to escape poverty is strong. Thus, for left-behind household members, we expect that, migration will: increase hours to farm work and domestic work. The effects of migration are expected to vary by gender. Given that off-farm wages are higher for men than women, and shadow wages of domestic work are higher for women than men, migration is expected to have a stronger positive effect on time spent on farm work and domestic work and a stronger negative effect on time on off-farm work for elderly women and girls than men and boys.

In the remainder of the paper, we will use the discussion above to guide our empirical investigation of the impact of labour migration on time use patterns of the left-behind elderly people and children. For the elderly people (aged 51 years and above), we look at the impacts of household members' out-migration on time spent on three types of activity: off-farm work, farm work and domestic work. For the children (aged between 7 and 14 years), we examine the effects of parents' out-migration on two types of activity: farm work and domestic work. We evaluate the following hypotheses: (i) the migration of household members increases the time spent on farm work and domestic for the left-behind elderly and decreases their time on off-farm work; (ii) the migration of parents increases the time spent on farm work and domestic work for the left-behind children; (iii) the effects of out-migration are larger for elderly women and girls, than elderly men and boys.

3. Empirical Methodology

We test the hypotheses concerning the impact of migration using an equation specified to analyze the determinants of the amount of time, H_{jit}, spent by an individual i on activity j, in period t. The equation takes into account the characteristics of individuals, households and villages, regional variation, and time effects that may affect the wages and shadow wages of individual i relative to other household members. The equation is specified below:

$$H_{jit} = \beta_0 + \beta_1 M_{it} + I_{it}'\beta_2 + Z_{it}'\beta_3 + V_{it}'\beta_4 + \gamma_p + \eta_t + u_{jit} \quad (1)$$

where:

j = 1, 2 and 3, and refers to off-farm (wage employment and self-employment), farm, and domestic work, respectively, for the non-migrating elderly and the non-migrating children;

i=1 and 2, and refers to non-migrating elderly and non-migrating children;

M is the variable for migration, measured by number of household members who are away from home in search of employment elsewhere for the elderly equations and by number of parents who are away from home to seek employment elsewhere for the children equations;[8]

I is a vector of variables reflecting the characteristics of individuals, such as years of schooling and age;

Z is a vector of variables that measure the characteristics of the household, such as access to land, farm equipment, unearned income, and composition of the household by gender and by age;

V is a vector of variables that measures the economic development characteristics of the village and includes the proportion of the labour force in agriculture, dummy variables for villages having electricity, paved road or childcare, and income per capita in log form;

β_k, k = 0, 1,2, 3 and 4 are unknown regression parameters; β_1 is the parameter of primary interest, which measures the impact of migration through both changes in relative shadow wages and remittance;[9]

γ_p and η_t are, respectively, a vector of province-fixed effects and time effects; and

u is an error term.

There are two main econometric issues concerning the determination of time-use equation (1). First, the dependent variable H_{jit} is censored at zero because a large number of individuals provide zero hours of work in some activity j. For instance, elderly women have a low participation rate (and hence provide zero hours) in off-farm work; elderly men have a low participation rate in domestic work; and the incidence of child labour in both farm work and domestic work is also fairly low. Second, the variable for migration is endogenous since intra-household time allocations may be determined simultaneously with migration decisions. To control for the simultaneous bias, we introduce an instrumental variable for household migration, which is defined as the proportion of the households with members that are away from home to seek employment elsewhere, excluding the household to which individual i belongs, in the village. We assume that the village-level migration variable is correlated with the migration variable at the household level but has no

direct effect on the time allocation, given that the migration effect and a host of individual, household and local market characteristics are taken into account. We estimate equation (1) using pooled cross-section and time series instrumental variable Tobit (IV-Tobit) techniques.[10] The standard errors of the estimates are corrected for heteroscedasticity and intra-household clustering.

4. Data

The dataset used in this study is derived from the *China Health and Nutrition Survey* (CHNS), which was carried out for the years 1989, 1991, 1993, 1997, 2000, 2004, and 2006.[11] Each survey covers about 4,400 households and 16,000 individuals in both urban and rural areas from nine provinces: Heilongjiang, Liaoning, Shandong, Henan, Jiangsu, Hubei, Hunan, Guizhou, and Guangxi. The survey provides rich socioeconomic information on individuals, households, and communities in the sample. Our analysis focuses on individuals residing in rural villages for the available years from 1997 to 2006.[12] Omitting observations with missing information, we have a sample of 3,333 and 3,231 person/year observations, respectively, for women and men aged 51 years and older, and a sample of 1,579 and 1,742 person/year observations, respectively, for girls and boys aged between 7 and 14 years.[13]

The dependent variables are analyzed as the number of hours per year allocated to off-farm and farm work and the number of hours per day for domestic work.[14] The types of tasks included in each activity are as follows: off-farm work includes time allocated to wage employment in local villages and self-employment activities such as

small handicraft and small commercial household businesses. Time allocated to wage and self-employment is aggregated into one category because the number of observations in self-employment is too small to permit analysis of self-employment as a separate activity. Farm work captures unpaid time spent on the family farm and includes activities such as crop production, gardening, livestock/poultry raising and fishing. Domestic work captures unpaid time allocated to work in one's own household and includes time allocated to tasks such as grocery shopping, cooking, washing, cleaning and taking care of children aged 6 years or younger.

In terms of the explanatory variables, the two variables for household migration *M* – the variables of primary interest – and their instrumental variable are defined in the previous section. The variables at the individual level in *I* include variables to proxy for human capital such as years of schooling and age categories for the elderly equations and gender and age for the children equations.[15] The variables at the household level in *Z* include variables measuring the composition of household members by age and sex, land area per adult, capital assets used in farming and non-farming activities and unearned income.[16] The variables at the village level in *V* include variables measuring the characteristics of local markets for labour and services and infrastructure, associated with economic development – proportion of the village labour force primarily engaged in agriculture, village income per capita[17], and three dummy variables based on whether the village in which individual i resides has access to electricity, paved roads, and center-based childcare. The variables of income per capita, unearned income and capital assets are discounted by the consumer price index at the

provincial level with 1990 as the base year. The price index is obtained from *China Statistical Yearbooks* of various years. The descriptive statistics and precise definitions of the explanatory variables are presented in Appendix A.

5. Results

5.1 Summary statistics and broad time allocation patterns

Summary statistics of migration for the period 1997 to 2006, based upon the CHNS data, are presented in Table 1. For the sample of elderly people, the proportion of individuals residing in households, with at least one member out migrating, rose from 20 percent to 37 percent, and the number of migrants per household (with migrants) increased from 1.48 to 1.84, between 1997 and 2006. With respect to the sample of children, the proportion of children having at least one parent out migrating doubled, from 5.5 to 11.1 percent during the sample period. Most out-migrating parents are fathers, although some children in the sample do have both parents migrating, since the average number of parents migrating per household is greater than one, throughout the period.

Time allocation patterns changed substantially between 1997 and 2006 (the table is not presented here but is available on request). For elderly women and men, the participation rate and the amount of time allocated to off-farm work increased dramatically, and their participation rates and amounts of time allocated to farm work declined. Children's participation rates in both domestic and farm work increased.

5.2 Migration and time allocation

Summary statistics of work hours and participation rates, presented in Table 2, contrast the time allocation patterns of groups of individuals in households with at least one migrant, and households without a migrant. While elderly people and children are the focus of our analysis, we also present the time use of non-migrating married women aged between 20 and 50 years (non-elderly women) to depict a broad picture of the time allocation patterns of the left-behind rural residents. Married, non-elderly women whose husbands are migrating spend more time on off-farm and farm work and less time than their counterparts whose husbands have not migrated. However, the differences are small, amounting to, on average, 28 and 16 hours per year for off-farm and farm work and -0.23 hour per day for domestic work; and only the differences in off-farm and farm work are statistically significant.

For the elderly, the differences in time allocation patterns of those in households with and without migrants are striking, particularly compared to the differences for non-elderly, married women, the population group previously examined. Elderly men and women in households with at least one migrant provide substantially more hours to all three work categories, compared to elderly in households with no migrants. Quantitatively, elderly men from households with migrants worked 180 and 114 more hours per year, respectively, on off-farm and farm work and 0.16 more hours per day on domestic work, than did their counterparts from households with no migrants. For elderly women, the differences in hours worked between the two types of households are even larger, with a gap of 190 and 200 hours per year, respectively, for off-farm and farm work and 0.26 hours per day for domestic work.

Turning to children, there is no statistically significant difference in the amount of time allocated to either farm or domestic work for boys who have at least one migrating parent and boys whose parents are not migrating. In contrast, for girls, being in a household with at least one migrating parent means that they provide, on average, 16 more days per year to farm work and 0.15 hours per day to domestic work, and the differences in both activities are statistically significant.

The comparisons of time use of individuals in households with and without migrants indicate that there is a positive association between migration and the rise of work time in all three activities for the left-behind married, non-elderly women, elderly people of both sexes, and girls. Further, the increase in work time is particularly large for elderly women, suggesting that loss of household labour through migration has been compensated for primarily by elderly women.

Turning now to the multivariate analysis, estimating equation (1) permits an examination of the impacts of migration on time use, controlling for other factors, as described in the previous section. The results concerning the impact of migration on time allocated to off-farm, farm, and domestic work for the elderly are presented in Table 3; the results on the impact of migration on time allocated to farm and domestic work for children are presented in Table 4. We compute the marginal effects of migration on (i) the amount of time allocated to each category of work for individuals who participate in that category, (ii) the amount of time allocated to each category of work for the whole sample, and (iii) the probability of participating. We present only the IV-Tobit estimates in Tables 3 and 4 because the Hausman test statistics indicate,

except for the off-farm equations for the elderly people, that the migration variable at the household level is endogenous for all equations and thus the (non-IV) Tobit estimates are inconsistent.

Starting with an examination of the migration effects on the time use of the elderly in off-farm work, the estimates show that migration has a negative effect on work hours and on the probability of participation for both women and men, but the effects are statistically insignificant. In contrast, the estimates for farm work indicate that migration increases the amount of time allocated to farm work for both women and men and the migration effects are significant at the 1 percent level for women and 10 percent level for men. Quantitatively, the migration of a household member increases the time spent on farm work by 197 hours a year for all elderly women in the sample and by 138 hours a year for those who already participate in farm production, and increases the probability of an elderly woman's participation in farm work by 12 percent; the respective estimates for elderly men are 105 hours per year, 74 hours per year, and 6 percent. Clearly, migration has shifted more farm work to elderly women than elderly men, because elderly men have more off-farm employment opportunities in local labour markets than elderly women, as Table 2 indicates.[18]

Migration of household members also increases the time use of the elderly to domestic work. The estimates show that the migration of one household member increases the time spent on domestic work by 0.502 hour per day for all the elderly women in the sample and by 0.377 hour per day for those who already participate in domestic work, and increases the probability of participation by 7 percent; and the

respective estimates for the elderly men are 0.154 hour per day, 0.118 hour per day and 7.5 percent. Thus, as was found with respect to farm work, migration of a household member increases the amount of time allocated to domestic work to a greater extent for elderly women, than for elderly men.

We turn now to the multivariate analysis of the impact of migration on the time use of children and the results are presented in Table 4. Since the participation rate for children in farm work is low, the regression for the determinants of hours allocated to farm work is estimated for boys and girls together. The migration of one household member does increase the hours allocated to farm work by children. Notice that for children already participating in farm work, the number of hours increases by only 4 hours per year but for children not previously participating, the number of hours increases by 114 hours per year and the participation rate increases by 2.1 percent. For girls, compared to boys, however, notice that the participation rate increases by a dramatic 35.4 percent. All three variables capturing the migration impact on time use of children are statistically significant at the 1 percent level.

The impacts of migration on time allocated by girls and boys to domestic work are larger than impacts for elderly women and men. As shown in Table 4, the migration of one parent increases the time allocated by girls to domestic work by 0.751 hours per day and for boys, by 0.177 hours per day; these impacts compare to 0.502 and 0.154 hours/day for elderly women and men, as discussed above. The unconditional effects are even larger and are estimated to be 0.735 hours per day for girls and 0.239 hours per day for boys. Migration increases the participation rate by

54 percent for girls and 27 percent for boys. These three results are statistically significant. The results are also empirically large, relative to the impacts on the elderly, as noted above, and also in terms of the impact over the year.

The estimates for household composition variables also reveal a striking labor substitution between grand-mothers and grand-daughters. The estimate in Table 3 shows that an increase in the number of girls aged 7 to 14 significantly reduces elderly women's domestic time (by 0.284 hour a day), whereas the estimates in Table 4 indicate that an increase in the number of women in the age groups of 51 to 69 and 70 and above decreases girls' domestic time by 0.163 and 0.142 per day, respectively, and both effects are statistically significant.

5. Conclusion

The main finding of this study is that migration of a household member substantially increases the amount of work undertaken by elderly people and children left-behind in rural areas. Based upon the multivariate analysis, we found that: (i) the migration of household members increases the time spent on farm work and domestic work for the left-behind elderly and has no significant effect on their time on off-farm work; (ii) the migration of parents increases the time spent on farm work and domestic work for the left-behind children. Importantly, migration has striking gender differentiated impacts with the increase in work time being greater for elderly women and girls than elderly men and boys.

These empirical findings support hypotheses that migration modifies the

household division of labour along gender and generational lines. The increased time and participation of elderly women in farm work, both in absolute terms and relative to men, is indicative of a changing gendered division of labour consistent with a shift in the boundary of inside work. However, migration is not associated with an increase in time allocated to by elderly women to the off-farm sector. In addition, while there is evidence of increased hours allocated by elderly women to farm work, further research is required on whether this increased time is associated with greater control over farming decisions and control within the household. There is also evidence of a change in the intergenerational division of labour given the finding that migration of a household member leads to an increase in the hours allocated by the elderly, and particularly, elderly women, to domestic work. With respect to children, the finding that migration of a parent increases the domestic work of girls more than boys reinforces a traditional gendered division of labour.

These time allocation results complement other studies of the impact of migration on the well-being of left-behind population, which have examined well-being in terms of indicators such as depression among the elderly and educational performance among children. The increased work of elderly women and girls in households with one or more migrant is particularly notable and further research is required to assess whether the increased work time is having adverse consequences.

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Table 1: Summary statistics of migration for the sample villages, 1997 to 2006[1]

Year	Elderly people		Children		
	Households with at least one member migrating (%)	Number of household members migrating [2] (person)	At least one parent migrating (%)	Father migrating (%)	Number of parents migrating (person)
1997	20.00 (40.02)	1.48 （0.75)	5.50 (26.64)	4.71 (21.2)	1.09 （0.28）
2000	24.40 (42.97)	1.50 (0.70)	12.82 (38.82)	9.23 (28.95)	1.18 (0.38）
2004	29.77 (45.74)	1.68 (0.83）	8.52 (31.39)	6.13 (24.01)	1.14 （0.35）
2006	37.09 (48.32)	1.84 （0.95）	11.11 (34.47)	9.52 (29.38)	1.10 （0.30）

Notes:
1. Figures in parentheses are standard deviations.

Source: All tables are based on CHNS.

Table 2: Summary statistics of time use, by migration status[1], gender, and age

	Households with migrants[2]		Households without migrants	
	Hours[3]	Participation (%)	Hours	Participation (%)
Married women aged 20-50 years (no. obs. = 5,055)				
Off farm labour	716.79**	51.47	689.24	39.67
Farm labour	831.74**	75.21	815.95	74.30
Domestic labour	2.51	91.91	2.74	93.52
Elderly men aged 51 and above (no. obs. = 3,231)				
Off farm labour	781.96***	55.38	602.97	39.66
Farm labour	689.79***	68.94	576.19	61.85
Domestic labour	0.74**	51.22	0.58	43.33
Elderly women aged 51 and above (no. obs. = 3,333)				
Off farm labour	473.01***	39.26	281.85	24.84
Farm labour	778.89***	70.24	579.87	61.01
Domestic labour	2.40***	87.62	2.14	85.13
Boys aged 7-14 years (no. obs. = 1,741)				
Farm labour	4.53	2.79	8.29	3.93
Domestic labour	0.07	16.08	0.10	18.19
Girls aged 7-14 years (no. obs. = 1,579)				
Farm labour	29.50*	7.81	13.69	5.92
Domestic labour	0.42**	32.81	0.27	27.91

Notes: 1. The migration variable is measured by whether the husband is migrating for married, non-elderly women, whether the household has at least one member out-migrating for the elderly, and whether at least one parent is out migrating for children.

2. ***, ** and * denote, respectively, statistical significance at the 1%, 5% and 10% level for the difference in the amount of time spent on a given activity between individuals having household members migrating and individuals with no migrating household members.

3. Farm work and off-farm work hours measured in hours/year; domestic work hours measured in hours/day.

Table 3 Marginal effects of migration on time allocation for women and men aged 51 years and over (IV tobit estimates)

	Off-farm work (hours/year)		Farm work (hours/year)		Domestic work (hours/day)	
	Women	Men	Women	Men	Women	Men
Number of family members out migrating						
Unconditional Effect	-23.590 (51.244)	-11.047 (102.840)	196.501 (58.769)***	104.631 (55.63)*	0.502 (0.145)***	0.154 (0.074)**
Conditional Effect	-25.819 (56.045)	-8.601 (80.060)	138.047 (41.285)***	73.556 (39.102)*	0.377 (0.109)***	0.118 (0.056)**
Probability of Participation	-0.019 (0.042)	-0.006 (0.054)	0.120 (0.036)***	0.063 (0.033)*	0.070 (0.020)***	0.075 (0.036)**
Covariates						
Log land/labour	59.843 (18.645)***	0.964 (30.890)	252.702 (25.146)***	293.412 (25.514)***	0.055 (0.053)	0.038 (0.028)
Log equipment	3.880 (3.805)	17.967 (6.177)***	9.969 (5.084)**	15.776 (5.133)***	0.005 (0.013)	-0.002 (0.007)
Log unearned income	-5.692 (2.685)**	-0.144 (5.964)	-5.983 (3.998)	-2.178 (3.897)	0.038 (0.011)***	0.023 (0.005)***
Age 61-70	-83.745 (21.321)***	-168.069 (42.485)***	-148.828 (33.386)***	-60.787 (33.554)*	-0.104 (0.088)	0.036 (0.047)
Age 70 over	-251.901 (30.735)***	-378.656 (82.542)***	-527.388 (53.033)***	-366.344 (74.735)***	-1.001 (0.191)***	-0.075 (0.105)
Years of schooling	4.959 (3.698)	27.131 (5.661)***	-6.959 (4.799)	-13.680 (4.613)***	0.008 (0.012)	0.007 (0.005)
Having young Children	-10.319 (24.178)	-27.020 (44.313)	-85.940 (36.344)**	-53.362 (38.511)	1.113 (0.114)***	0.193 (0.053)***
Boys 7-14	-29.269 (30.735)	-66.533 (45.966)	-45.009 (40.062)	-68.578 (47.733)	-0.017 (0.103)	-0.133 (0.070)*
Girls 7-14	41.943 (29.801)	28.133 (56.291)	-65.490 (41.861)	-21.309 (45.425)	-0.284 (0.110)***	0.025 (0.076)
Men 15-25	-0.551 (26.24)	19.630 (42.309)	-15.663 (32.523)	-23.107 (31.823)	-0.013 (0.080)	0.041 (0.047)
Women 15-25	-27.770 (26.612)	-74.579 (46.408)	-10.675 (28.74)	0.077 (27.021)	-0.139 (0.082)*	-0.181 (0.044)***
Men 26-39	-3.973 (22.788)	-33.998 (44.580)	13.355 (34.444)	-46.057 (37.547)	0.130 (0.094)	0.109 (0.049)**
Women 26-39	-51.649 (28.867)*	36.973 (51.476)	-24.748 (41.354)	101.185 (46.018)**	0.045 (0.111)	-0.112 (0.062)*
Men 40-50	87.483 (37.518)**	-211.276 (131.620)	129.757 (62.703)**	-158.022 (98.418)	-0.016 (0.130)	-0.045 (0.111)
Women 40-50	-133.945 (33.652)***	327.498 (85.458)***	-336.738 (53.247)***	43.425 (52.430)	-0.974 (0.153)***	-0.487 (0.039)***

Men 51-69	58.594 (24.178) **	-21.153 (117.410)	147.623 (34.999) ***	-260.092 (124.670) **	0.250 (0.086) ***	-0.255 (0.120) **
Women 51-69	-57.648 (52.624)	115.346 (47.572) **	-386.526 (78.395) ***	103.123 (41.834) **	-1.272 (0.221) ***	-0.670 (0.059) ***
Men 70 +	69.385 (37.480) **	-231.626 (95.815) **	178.369 (51.588) ***	-209.907 (99.899) **	0.363 (0.114) ***	-0.297 (0.121) **
Women 70 +	-84.284 (43.129) **	-53.140 (62.340)	-271.441 (69.462) ***	40.779 (51.316)	-0.934 (0.164) ***	-0.313 (0.048) ***
% agricultural labour force	-58.401 (57.784)	-228.743 (128.290) *	72.487 (61.092)	14.682 (57.753)	-0.220 (0.143)	-0.250 (0.074) ***
Log (per capita income)	50.595 (22.900) **	143.728 (46.382) ***	-21.169 (21.789)	-11.354 (23.901)	0.072 (0.065)	0.074 (0.035) **
Having electricity	148.772 (36.424) ***	-113.312 (312.030)	8.913 (99.572)	221.564 (95.093) **	0.118 (0.221)	-0.413 (0.227) *
2000	11.404 (44.660)	-16.234 (58.062)	-108.202 (33.357) ***	-111.034 (34.103) ***	-0.071 (0.098)	0.155 (0.064) **
2004	590.483 (104.350) ***	631.974 (119.910) ***	-217.337 (38.730) ***	-161.585 (40.422) ***	-0.509 (0.102) ***	0.002 (0.056)
2006	593.238 (100.490) ***	624.238 (121.460) ***	-314.448 (44.427) ***	-262.714 (44.311) ***	-0.584 (0.121) ***	-0.016 (0.063)
First-stage migration and IV correlation test						
T test	14.94	16.04	14.94	16.04	14.94	16.04
P value	0.00	0.00	0.00	0.000	0.00	0.000
Hausman test						
χ^2 test	0.45	0.01	59.08	21.71	15.97	32.75
P value	0.500	0.906	0.00	0.00	0.00	0.00
Test for zero slopes						
χ^2 test	489.21	935.20	853.75	519.92	500.67	424.39
P value	0.000	0.000	0.000	0.000	0.000	0.000
No. obs.	3333	3231	3333	3231	3333	3231

Notes: Conditional effects are marginal effects for the participants and unconditional effects are for the whole sample. Standard errors presented in parentheses are robust to heteroscedasticity and intra-household clustering. ***, **, and * denote significance levels of 1%, 5% and 10%, respectively. Each regression also includes the intercept, province dummies, and dummy variables for villages having pave road and having childcare. The village dummy variables that are statistically insignificant are omitted to streamline the presentation.

Table 4: Marginal effects of parent out-migration on farm and domestic hours for children aged between 7 and 14 years

	Farm work (hours/year)	Domestic work (hours/day)	
	Girls and boys combined	Girls	Boys
	IV-Tobit	IV-Tobit	IV-Tobit
Number of parents out migrating			
Conditional Effect	3.756 (0.997)***	0.751 (0.275)***	0.177 (0.080)**
Unconditional Effect	113.903 (30.230)***	0.735 (0.264)***	0.239 (0.103)***
Probability of participation	0.021 (0.006)***	0.536 (0.193)***	0.266 (0.116)***
Covariates			
Girl	0.354 (0.166)**	----	----
Age	0.263 (0.038)***	0.065 (0.007)***	0.020 (0.003)***
Log land/labour	-0.340 (0.139)**	0.056 (0.024)**	0.019 (0.010)*
Log equipment	0.051 (0.024)**	0.002 (0.005)	0.001 (0.002)
Log unearned income	-0.032 (0.021)	0.004 (0.005)	0.002 (0.002)
Having young Children	0.212 (0.156)	0.256 (0.043)***	0.063 (0.021)***
Boys 7-14	0.230 (0.124)*	0.006 (0.035)	0.006 (0.011)
Girls 7-14	0.039 (0.121)	0.082 (0.027)***	-0.011 (0.012)
Men 15-25	0.289 (0.183)	-0.001 (0.041)	-0.017 (0.021)
Women 15-25	0.088 (0.13)	-0.049 (0.043)	-0.003 (0.018)
Men 26-39	0.523 (0.238)**	0.171 (0.073)**	-0.008 (0.021)
Women 26-39	-0.051 (0.248)	-0.052 (0.065)	0.016 (0.027)
Men 40-50	1.044 (0.228)***	0.161 (0.077)**	-0.006 (0.022)
Women 40-50	0.217 (0.262)	0.061 (0.081)	0.029 (0.033)
Men 51-69	-0.077	-0.039	-0.012

	(0.202)	(0.06)	(0.020)
Women 51-69	-0.343 (0.234)	-0.163 (0.037) ***	-0.024 (0.019)
Men 70 +	-0.390 (0.474)	0.031 (0.094)	-0.036 (0.018) *
Women 70 +	-0.300 (0.288)	-0.142 (0.043) ***	-0.002 (0.025)
Village having childcare	-0.154 (0.150)	-0.070 (0.033) **	-0.025 (0.012) **
2000	-0.493 (0.219) **	0.033 (0.048)	-0.003 (0.018)
2004	3.364 (0.220) ***	0.312 (0.079) ***	0.158 (0.035) ***
2006	5.100 (0.241) ***	0.475 (0.092) ***	0.188 (0.041) ***
Firs-stage migration and IV correlation test			
T test P value	7.57 0.0	6.57 0.0	9.08 0.0
Hausman test			
χ^2 test P value	10.39 0.001	5.00 0.010	6.58 0.010
Test for zero slope			
Test score P value	178.0 0.0	229.82 0.0	180.65 0.0
No. obs.	3321	1579	1742

Notes: Tobit and IV-Tobit estimates are presented. Conditional effects are marginal effects for the participants and unconditional effects are for the whole sample. Standard errors presented in parentheses are robust to heteroscedasticity and intra-household clustering. ***, **, and * denote significance levels of 1%, 5% and 10%, respectively. Each regression also includes the intercept, province dummies, and village-level variables such as proportion of agricultural labour force, per capita income in log form, and dummy variables for villages having electricity and paved road. The village-level variables that are statistically insignificant are omitted to streamline the presentation.

Appendix A: Descriptive statistics of explanatory variables involved in regressions

Variable	Aged 7–14 years		Aged 51 years and over	
	Boys	Girls	Women	Men
No. parents migrating	0.093	0.092		
	(0.326)	(0.327)	----	----
No. HH members migrating			0.498	0.486
	-----	-----	(0.907)	(0.888)
Age (years)	10.704	10.814		
	(2.269)	(2.273)	---	---
Age 51-60 years			0.535	0.563
	----	----	(0.499)	(0.496)
Age 60-70 years			0.280	0.295
	----	----	(0.449)	(0.456)
Age 70 over years			0.186	0.141
	----	----	(0.389)	(0.349)
Education (years)			2.315	5.219
	----	----	(3.035)	(3.468)
Cultivated land (*mu*)*	6.378	5.809	4.711	4.895
	(15.858)	(9.521)	(9.646)	(9.934)
Farm and commercial	717.629	621.698	328.923	340.468
equipment (*yuan*)	(3151.001)	(2421.303)	(1491.857)	(1464.701)
Unearned income	589.742	496.754	777.177	737.231
(*yuan*/year)**	(2108.574)	(1856.203)	(2199.614)	(1946.503)
Household composition				
Children aged 6 or younger	0.06	0.154	0.498	0.486
	(0.265)	(0.419)	(0.907)	(0.888)
Boys aged 7-14	1.057	0.346	0.156	0.147
	(0.558)	(0.526)	(0.423)	(0.407)
Girls aged 7- 14	0.304	1.075	0.104	0.084
	(0.523)	(0.641)	(0.338)	(0.301)
Men 15-25	0.095	0.174	0.086	0.077
	(0.318)	(0.447)	(0.307)	(0.295)
Women 15-25	(0.197)	0.174	0.173	0.196
	(0.485)	(0.470)	(0.429)	(0.460)
Men 26-39	0.648	0.611	0.16	0.181
	(0.497)	(0.507)	(0.434)	(0.466)
Women 26-39	0.736	0.711	0.289	0.253
	(0.451)	(0.471)	(0.505)	(0.485)
Men 40-50	0.273	0.297	0.23	0.199
	(0.446)	(0.457)	(0.444)	(0.417)
Women 40-50	0.226	0.246	0.092	0.037
	(0.418)	(0.431)	(0.292)	(0.192)
Men 51-69	0.131	0.133	0.057	0.161

	(0.342)	(0.343)	(0.232)	(0.368)
Women 51-69	0.142	0.133	0.616	0.851
	(0.350)	(0.340)	(0.489)	(0.368)
Men70 +	0.029	0.029	0.815	0.654
	(0.169)	(0.168)	(0.389)	(0.476)
Women 70 +	0.064	0.051	0.121	0.175
	(0.245)	(0.221)	(0.327)	(0.384)
Village characteristics				
Proportion of HHs with migrants	0.311	0.326	0.320	0.314
	(0.242)	(0.252)	(0.197)	(0.195)
Share of agricultural labour force	0.621	0.61	0.562	0.563
	(0.231)	(0.235)	(0.246)	(0.250)
Village per capita income (*Yuan*/year)	1029.945	1005.9)	1168.475	1167.875
	(653.448)	(561.086)	(717.87)	(706.611)
Having child care	0.474	0.495	0.488	0.483
	(0.499)	(0.500)	(0.500)	(0.500)
Having paved road	0.407	0.425	0.505	0.503
	(0.491)	(0.494)	(0.500)	(0.500)
Having electricity	0.983	0.975	0.988	0.989
	(0.128)	(0.155)	(0.108)	(0.102)

Notes: *Fifteen *mu*s are equal to one hectare. **Non-earned income includes subsidies a household received for having only one child and gas, fuel, coal and electricity, rental payments for household assets, payments by boarders and lodgers, money received from poverty, welfare funds and cash income received from other relatives.

Endnotes

[1] Migration has accompanied ongoing structural change in the rural economy represented by the decline in relative employment in the farm sector from 60 to 40 percent between 1991 and 2006 (UNDP 2008: 19), a shift from collective farming to household user rights to land (Judd 2007), a movement away from the cultivation of grain to commercial crops and animal husbandry (Jacka 1997) and a rise in off-farm employment in the township and village enterprises (Meng 1998; Dong 1998) and self-employment opportunities (Mohapatra et al 2007; Zhang et al 2004).

[2] Children are typically defined as people less than 15 years of age for the reason that it is illegal to hire people younger than 16 years of age and there are nine years of compulsory education in China. The elderly population has been defined in several studies as people above the age of 50 years (Davis-Friedmann 1993, as cited in Pang et al 2004).

[3] http://www.dol.gov/ilab/media/reports/iclp/sweat/china.htm

[4] http://www.china-labour.org.hk/en/node/100491

[5] In addition to the split household, Fang and Wang (2008) describe two less frequent household divisions, namely, an "outside-outside" household division in which both parents migrate and a second generation migration household in which parents return to the village and children migrate.

[6] The agricultural labour market is "thin" because labour usage is highly synchronized across households due to the seasonality of agricultural production, supervision costs for hired farm labourers are high, the majority of Chinese households have some access to land, and landholding size is homogenous compared to other parts of the world. Further, institutional features of China's land tenure system make households hesitant to use hired labourers (or lease land out) due to the concern that it may hinder their claims to future land user rights.

[7] For the sake of simplicity, we use an unitary model to develop a conceptual framework for our analysis. We recognize that while labour may be allocated to maximize household welfare, individual household members do not necessarily have equal work burdens nor equal shares of the income, goods and services generated by household labour. Further, household members' influence over their own time use will vary, and children, in particular, may have little control over the use of their time.

[8] Since the incidence of out-migration of mothers is too low to include as a separate category in the regressions, we only include an aggregate measure for mothers and/or fathers' out-migration. We recognize that the impacts on the time allocation of children may differ depending on which parent is migrating and whether both parents simultaneously migrate, unfortunately, we cannot address this issue with the data.

[9] Data on remittances of family members are unavailable.

[10] We choose a pooled cross-section and time series technique instead of a panel model due to the technical difficulty of jointly tackling simultaneous bias and censored variable bias in the panel model. A fixed-effects panel analysis is particularly difficult for the children's equations; the large time lags between two cross-sections in the CHNS (3 to four years) and the age limitation substantially

reduce the number of children that have more than one time-series observations in the sample.

[11] The CHNS is implemented jointly by the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention.

[12] We use the data from 1997 to 2006 instead of all cross-sections of observations because information on migration at the household level is available only from 1997 onwards.

[13] The household numbers are an average of the four cross-sections. Due to population aging, the number of households having children aged between 7 and 14 years in the sample fell from 761 in 1997 to 410 in 2006, whereas the number of households with people aged 51 years and older increased from 785 in 1997 to 1,310 in 2006.

[14] The time use data are collected from each household by an interviewer. Time allocated to off-farm and farm work is derived from the following question: with reference to an activity, how many hours did you work in a day, on average? Time allocated to domestic work is derived from questions on various domestic activities of the following form: how many minutes did you spend on this activity in a day? Annual amounts of time are generated using information on the number days per week, weeks per months, and months per year. Seasonality cannot directly be taken into account using this method.

[15] We do not control years of schooling for children because this variable is endogenous and we do not have an adequate instrument for this variable. We also do not control for parents' education levels due to the unavailability of such information for migrating parents. The omission of children's schooling and parents' education can lead to an underestimate of the pure effect of labour migration, given that: the probability of migration increases with an individual's education; parents' labour migration may afford their children more education; and a child's time spent on farm and domestic work is negatively correlated with his/her years of schooling. In this regards, the estimates of migration effects on children obtained by the present study only provide a lower bound of the true effect.

[16] Unearned income includes subsidies a household received for having only one child, as well as subsidies for gas, fuel, coal and electricity, rental payments for household assets, payments by boarders and lodgers, money received from poverty, welfare funds and cash income received from other relatives. The variable does not include remittances from family members.

[17] We also included average monthly wages for males and females in the regressions (although the results are not presented in this paper) and found none of the wage variables statistically significant. Thus, the wage variables are omitted to streamline the presentation.

[18] We also tested the gender differences in migration effects on off-farm, farm and domestic work using an interactive gender dummy variable for a pooled female and male sample and found the gender differences to be statistically significant except for off-farm work regression, consistent with results presented here.